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EXAMINER	
HARRISON, NICOLE K	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/516,642	THIERAUF ET AL.	
	Examiner	Art Unit	
	NICOLE HARRISON	4152	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-54* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-39 and 41-54* is/are rejected.

7)☒ Claim(s) *11 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/10/06, 7/20/07, & 8/21/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 04/10/2006, 07/20/2007, and 08/21/2007 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered.

2. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered. For example, a copy of GIT Labor-Fachzeitschrift 12/99, pages 1318 to 1320 was not included in the application.

Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.

(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
(f) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

Claim Objections

1. Claim 1 is objected to because of the following informality: The lower range for the specific surface area of the coating includes an additional g in the units. Appropriate correction is required.

2. Claims 11 and 40 are objected to as not further limiting the claims. It appears that claims 11 and 40 refer to the ceramic oxide base material which is the same material as claimed in claims 1 and 31, therefore these claims are not considered further limiting.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-3, 6, 9, 10, 12,17-19, 25, 26, 29, 30, 35, 36, 41, 52 and 53 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth the metes and bounds of the patent protection desired. See MPEP § 2173.05(c). Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949). For example, claim 1 recites the broad recitation “specific surface area in a range of between 25 m^2/g and 200 m^2/g”, and the claim also recites “preferably between 40 m^2/g and 150 m^2/g” which is the narrower statement of the range/limitation.

Regarding claims 9 and 35, the phrase "such as" renders the claims indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Regarding claims 29 and 52, the phrase "for example" renders the claims indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

5. Claims 2, 3, 6, 10, 17-19, 26, 30, 36, 39, 51, and 54 are rejected under 35 U.S.C. 112, second paragraph, as having insufficient antecedent basis for the limitations in the claims.

Claim 2 recites the limitation "the pore openings are of an intergranular and/or intragranular nature". However, the pore openings were not discussed in the independent claim (claim 1).

Claim 3 recites the limitation "the free-breathing cross-section". However, the “free-breathing cross-section” was not discussed in the independent claims (claims 1 or 2).

Claim 6 recites the limitation "the mean layer thickness". However, the "the mean layer thickness" was not discussed in the independent claim (claim 1).

Claim 10 recites the limitation "the particles." However, “the particles” were not discussed in the independent claims (claims 8 or 9).

Claims 17-19 recite the limitation “the contact angle.” However, “the contact angle” was not discussed in the independent claim (claim 1).

Claim 26 recites the limitation "the solution of alkali metal siliconates in water." However, there is no mention of the “the solution” in the independent claim (claim 25). The claim for which the instant claim is dependent upon is incorrect.

Claim 30 recites the limitation "the photoefficiency calculated." However, "the photoefficiency" was not discussed in the independent claim (claim 1).

Claim 36 recites the limitation "the mean particle size of the particulate material." However, the "mean particle size" was not discussed in the independent claim (claim 33).

Claim 39 recites the limitation "the adhesion between the catalytically active coating…." However, "the adhesion" and the "catalytically active coating" were not discussed in the independent claim (claim 31).

Claim 51 recites the limitation "the superhydrophobic surface." However, "the superhydrophobic surface" was not discussed in the independent claim (claim 48).

Claim 54 recites the limitation "the hydrophobisation operation." However, "the hydrophobisation operation" was not discussed in any of the independent claim (claims 48-53). There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-3, 5, 11, 17-19, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477) in further view of Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), and Shima et al. (U.S. Patent No. 6,908,879).

Regarding claims 1 and 11, Ogawa et al. teaches a ceramic molded body such as a roof tile or tile (col. 3, lines 47-48) coated with a porous (col. 4, line 43) metal/ceramic oxide film having photocatalytic activity (col. 3, line 22) and antisoiling properties (col. 2, line 52). The ceramic-oxide coating can contain titanium dioxide, aluminum oxide, and silicon oxide (col. 4, lines 1-5).

Ogawa et al. fails to teach that the Aluminum oxide used in the coating is Aluminum Oxide C. However, Kanamori et al. discloses that Aluminum Oxide C can be used as the aluminum oxide in a photocatalytic coating film (col. 19, line 34-37). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Kanamori et al. before him or her, to modify the aluminum oxide of Ogawa et al. to include the colloidal alumina or Aluminum Oxide C of Kanamori et al. because it contributes to the improvement of the flexibility of the resultant coating layer when cured and the increase of its critical film thickness (col. 19, lines 12-14).

Ogawa et al. fails to teach the photocatalytically active oxide-ceramic coating having a specific surface area of between 25 m^2/g and 200 m^2/g. However, Hartmann et

al. discloses that a titanium dioxide mixed oxide can have a specific surface area between 10 and 150 m^2/g (col. 1, lines 31-35). One of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Hartmann et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", *In re Peterson* 65 USPQ 2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hartmann et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the titanium dioxide metal oxide of Hartmann et al. because it can be used for the production of photocatalysts (col. 2, lines 11-13) and has high temperature resistance and dispersability (col. 2, lines 17-20). Therefore, it would have been obvious to combine Hartmann et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Ogawa et al. fails to teach the mean diameter of the pore or the capillaries is in a range of between 0.1μm and 5μm. However, Shima et al. discloses that the average

pore diameter is generally in the range of 0.1-5μm (col.7, lines 52-53). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Shima et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the mean pore diameter of the catalytic particles of Shima et al. because if the average pore diameter is unduly large, the excess will be at a disadvantage in degrading the catalytic activity (col.7, lines 54-56). Therefore, it would have been obvious to combine Hartmann et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Regarding claim 2, Ogawa et al, Kanamori et al., Hartmann et al., and Shima et al. disclose the limitations of claim 1 as mentioned above. It would have been obvious to one of ordinary skill in the art that all ceramic materials (especially if sintered or fired) are porous, and therefore, contains capillaries. It would have been obvious that pores can be intergranular or intragranular in nature. Since Ogawa et al. teaches the materials of the ceramic molded body with a porous photocatalytic coating, it is necessarily present that the ceramic body will have either intergranular or intragranular pores.

Regarding claim 3, since the materials and characteristics of those materials are commensurate with the claims, the characteristics of the free breathing cross-section of the ceramic molded body would also be expected to be similar.

Regarding claim 5, Ogawa et al. fails to teach the photocatalytically active oxide-ceramic coating having a specific surface area of between 40 m^2/g and 100 m^2/g. However, Hartmann et al. discloses that a titanium dioxide mixed oxide can have a specific surface area between 10 and 150 m^2/g (col. 1, lines 31-35). However, one of

ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Hartmann et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", *In re Peterson* 65 USPQ 2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hartmann et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the titanium dioxide metal oxide of Hartmann et al. because it can be used for the production of photocatalysts (col. 2, lines 11-13) and has high temperature resistance and dispersability (col. 2, lines 17-20). Therefore, it would have been obvious to combine Hartmann et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Regarding claims 17-19 and 30, since the materials and characteristics of those materials are commensurate with the claims, the characteristics of the contact angle

and photoefficiency calculated from the photocatalytically-induced methylene blue breakdown would also be expected to be similar.

9. Claims 4, 7-9, and 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), and Shima et al. (U.S. Patent No. 6,908,879) in further view of Talpaert et al. (U.S. Patent No. 6,465,088).

Ogawa et al., Kanamori et al., Hartmann et al., and Shima et al. disclose all of the limitations of claim 1 as mentioned above.

Regarding claim 4, Ogawa et al. fails to teach the porous oxide-ceramic coating being disposed on the surface and in the pore openings and the free faces of the capillary structure to a depth of 2mm, measured in a vertical direction from the surface of the ceramic-molded body. Talpaert et al. discloses that "providing a substrate with a photocatalytic coating may mean that the coating is deposited on the substrate's surface, or alternatively that the coating may partly impregnate a substrate to within a certain depth when the substrate is porous" (col.5, lines 51-55). It would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the depth of the porous oxide-ceramic coating for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claims 7-9, Ogawa et al. fails to teach there being at least one layer with raised portions containing temperature-resistant ground material between the

oxide-ceramic base material and the photocatalytically active, porous, oxide-ceramic coating. However, Talpaert et al. discloses a thin layer (2) containing silicon oxycarbide particles between the substrate (1) and photocatalytic coating (3) (col.7, lines 31-32). The addition of the particulate material fixed to the substrate would cause the substrate layer to have a raised portion thereupon. Also, it would have been obvious to one of ordinary skill in the art at the time of invention that the photocatalytic coating comprising titanium oxide particles and a mineral binder (col. 6, lines 11-13) would have an uneven surface structure do to the various sizes of the particles in the coating layer. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the ceramic molded body of Ogawa et al. to include the thin layer of silicon oxycarbide of Talpaert et al. because it "act[s] as a barrier to the diffusion of alkali metals (this being deleterious to the photocatalytic property of the coating), and/or a layer which has an optical function" (col. 7, lines 32-34). Therefore, it would have been obvious to combine Talpaert et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Regarding claims 13-16, Ogawa et al. fails to teach that TiO_2 in the ceramic molded body is present in at least 40%, 70%, and 100% by weight with respect to the total amount of TiO_2, in the anatase structure. However, Talpaert et al. discloses that the anatase content of the TiO_2 particles of the coating have an anatase content greater than 50% by weight, preferably greater than 80% by weight (col.7, lines 8-11). Talpaert et al. does not teach the exact same proportions as recited in the instant claims. However, one of ordinary skill in the art at the time the invention was made would have

considered the invention to have been obvious because the compositional proportions taught by Talpaert et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", In re Peterson 65 USPQ2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the content of TiO_2 contained in the photocatalytically active, porous, oxide-ceramic coating and/or oxide-ceramic base material of Ogawa et al. to include the TiO_2 content contained in the photocatalytic coating of Talpaert et al. because it exhibits both a satisfactory level of photocatalytic activity and coating durability (col. 2, lines 7-8). Therefore, it would have been obvious to combine Talpaert et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

10. Claims 6, 31, 40, 46, and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent

No. 5,451,390), and Shima et al. (U.S. Patent No. 6,908,879) in further view of Tada et al. (U.S. Patent No. 6,074,981).

Regarding claim 6, Ogawa et al, Kanamori et al., Hartmann et al., and Shima et al. all teach the limitations of claim 1 as mentioned above. Ogawa et al. fails to teach the mean layer thickness of the coating. However, Tada et al. discloses a thickness range of 5nm – 2μm for the titanium oxide-based photocatalyst film (col. 3, lines 15-17). However, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Tada et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", *In re Peterson* 65 USPQ 2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Tada et al. before him or her, to modify the ceramic molded body of Ogawa et al. to include the film thickness of the photocatalytic coating layer of Tada et al. because if the thickness is too small, sufficient light is not

absorbed. If the film thickness is too thick, the photo carrier generated within the film cannot diffuse through the outer surface. In either case catalytic activity is reduced (col. 3, lines 10-13). Therefore, it would have been obvious to combine Tada et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Regarding claims 31, 40, 46, and 47, please refer to the rejections of claims 1 and 4 for the rejection of the instant claim.

Ogawa et al. additionally does not teach the process for producing the coarse-ceramic molded body. However, Tada et al. discloses mixing the photocatalytically active, oxide-ceramic powders in a liquid phase; applying the suspension produced in the previous step to the substrate to produce a layer; ventilation drying for 30 minutes, and then baking the coated body for 30 minutes at 500 degrees (Examples 1-9). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Tada et al. before him or her, to modify the process of producing the ceramic molded body of Ogawa et al. to include the manufacturing steps of Tada et al. because the particular process will allow the undercoat layer or particles on the surface of the substrate to diffuse to the photocatalyst layer, thereby increasing the photocatalytic activity (col. 4, lines 47-50).

11. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Talpaert et al. (U.S. Patent

No. 6,465,088) in further view of Mori et al. (Japanese Patent Publication No. 09-313948).

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Talpaert et al. disclose all of the limitations of claims 1, 8, and 9 as mentioned above.

Regarding claim 10, none of the references teach a size for the particles of the layer between the oxide-ceramic base material and the photocatalytically active, porous, oxide-ceramic coating. However, Mori et al. discloses that the particles of the first layer should have a size below 120nm, preferably between 5-70nm ([0023]). One of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the particle size proportions taught by Mori et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", *In re Peterson* 65 USPQ 2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Mori et al. before him or her, to modify the intermediate layer of Ogawa et al. to include the particle size of the materials used in

the first layer of Mori et al. because it could effect the barrier properties of the first layer. If the particles of the first layer are too large, then the particles of the photocatalytic layer could shift to the base material surface via a crevice between particles and carry out direct contact to resin thereby interacting with the substrate material ([0023]). Therefore, it would have been obvious to combine Mori et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

Regarding claim 12, none of the previous references teach the photocatalytically active, oxide-ceramic material having an average particle size in the range of 5nm and 100nm. However, Mori et al. discloses the photocatalytically active, oxide-ceramic material having an average particle size in the range of 20nm-120nm ([0033]). Mori et al. does not teach the exact same proportions as recited in the instant claims. However, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the size proportions taught by Mori et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of

percentage ranges is the optimum combination of percentages", In re Peterson 65 USPQ2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Mori et al. before him or her, to modify the average particle size of the photocatalytically active, oxide-ceramic material of Ogawa et al. to include the average particle size of photocatalytically active, oxide-ceramic material of Mori et al. because when the particle size is less than 20nm there is a chance that the photocatalyst particles can permeate the barrier layer or first layer and arrive at the base layer. If the size exceeds 120nm it may decrease the adhesion level between the first and second layers ([0033]). Therefore, it would have been obvious to combine Mori et al. with Ogawa et al. to obtain the invention as specified in the instant claim.

12. **Claim 20, 25, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), and Shima et al. (U.S. Patent No. 6,908,879) in view of Hayakawa (Japanese Patent Publication No. 10-237431) referred to as '431 and in further view of Hayakawa (Japanese Patent No. 409228545) referred to as '545.**

Regarding claim 20, Ogawa et al., Kanamori et al., Hartmann et al., and Shima et al. disclose all of the limitations of claim 1 as mentioned above. Ogawa et al. fails to teach the coating having a superhydrophobic surface, wherein the superhydrophobic surface has a contact/edge angle of at least 140 degrees. However, Hayakawa '431

discloses that a photocatalytic coating containing a photocatalytic oxide particle and a silicon- or silica-containing material can have a contact angle exceeding 140 degrees (Abstract). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hayakawa before him or her, to modify the photocatalytic coating of Ogawa et al. to include the silica particles contained in the photocatalytic coating of Hayakawa '431 because silica or silicon contained in the surface layer brings the water wet angle close to 0 degrees, thereby producing a superhydrophobic surface (Hayakawa '545: Abstract).

Regarding claim 25, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Hayakawa disclose all of the limitations of claim 20 as mentioned previously. However, Ogawa et al. fails to teach that the contact angle of the superhydrophobic surface is at least 150 degrees for water. However, Hayakawa '431 discloses that a photocatalytic coating containing a photocatalytic oxide particle and a silicon- or silica-containing material can have a contact angle exceeding 140 degrees (Abstract). Although Hayakawa does not teach the exact same proportions as recited in the instant claims, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Hayakawa overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed

ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", In re Peterson 65 USPQ2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hayakawa before him or her, to modify the photocatalytic coating of Ogawa et al. to include the silica particles contained in the photocatalytic coating of Hayakawa '431 because silica or silicon contained in the surface layer brings the water wet angle close to 0 degrees, thereby producing a superhydrophobic surface (Hayakawa '545: Abstract).

Regarding claims 27-28, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Hayakawa disclose all of the limitations of claim 20 as mentioned previously. Although the references do not explicitly state that the superhydrophobic surface of the coating has raised portions, it is obvious to one of ordinary skill in the art at the time of invention that the mixture of particulate material in the coating causes the surface to have elevated portions. Additionally the materials and characteristics of those materials given in the references are commensurate with the claims; therefore the raised portions of the superhydrophobic surface would also be expected to be similar.

Regarding claim 29, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Hayakawa '431 disclose all of the limitations of claim 20 as mentioned previously.

Ogawa et al. fails to teach that the superhydrophobic surface is applied using a mixture of particles and a hydrophobising agent. However, Hayakawa '431 discloses a surface that exhibits super water repellence and containing a light catalytic oxide particle and hydrophobic fluororesin (p.2). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hayakawa before him or her, to modify the photocatalytic coating of Ogawa et al. to include the silicone particles and fluororesin contained in the photocatalytic coating of Hayakawa '431 because the layer provides super water repellence (p.3).

13. **Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Hayakawa (Japanese Patent Publication No. 10-237431) in further view of Gosset et al. (U.S. Patent No. 4,632,848).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Hayakawa disclose all of the limitations of claim 20 as mentioned above. Ogawa et al. fails to teach that the superhydrophobic surface is provided using one or more compounds having straight-chain or branched-chain aromatic and/or aliphatic hydrocarbon residues with functional groups, wherein the functional groups are selected from amine, thiol, a carboxyl group, alcohol, disulfide, aldehyde, sulfonate, ester, ether or mixtures thereof. Ogawa et al. additionally fails to teach that the superhydrophobic surface produced using compounds selected from the group which consists of silicone oil,

amine oils, silicone resin, for example alkyl-polysiloxanes, alkoxysiloxanes, alkali metal siliconates, alkaline earth siliconates, silane-siloxane mixtures, amino acids and mixtures thereof. However, Gosset et al. discloses including potassium siliconate in the composition of a coating (col. 4, 14-17). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Gosset et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the potassium siliconate of Gosset et al. because potassium siliconate is known as a water repellent (hydrophobic) agent (col. 4, lines 14-17).

14. **Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Hayakawa (Japanese Patent Publication No. 10-237431) in further view of Heller et al. (U.S. Patent No. 5,616,532).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Hayakawa disclose all of the limitations of claim 20 as mentioned above. Ogawa et al. fails to teach that the superhydrophobic surface of the coating is produced using Ormoceres, polysiloxane, alkylsilane and/or fluorosilane, preferably in combination with Si02. However, Heller at al. discloses the addition of aryl or alkyl derived polysiloxanes (col. 8, lines 3-6) in the coating. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Heller et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the

polysiloxane of Heller et al. because it helps form hydrophobic, smooth, difficult to oxidize, thermostable, and hard film (col.8, lines 6-8).

15. **Claims 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Hayakawa (Japanese Patent Publication No. 10-237431) in further view of Roedel (U.S. Patent No. 4,252,569).**

Regarding claim 24, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Hayakawa disclose all of the limitations of claim 20 as mentioned above. Ogawa et al. fails to teach that the superhydrophobic surface is applied using a solution of alkali metal siliconates in water, wherein alkali metal is selected from the group which consists of lithium, sodium, potassium and mixtures thereof. However, Roedel discloses a process for producing alkali metal (potassium or sodium) siliconates in a solution of water (Col.3, lines 53-56). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Roedel before him or her, to modify the superhydrophobic surface of Ogawa et al. to include the solution of alkali earth siliconate of Roedel because organic solvent, silicone resin solutions act as a water repellent (col.1, lines 15-18).

Regarding claim 26, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Hayakawa disclose all of the limitations of claims 20 and 25 as mentioned above. The references fail to teach that the solution of alkali metal siliconates in water has a

dilution ratio of between 1:100 and 1:600 (by weight/by weight). However, Roedel discloses a process for producing alkali metal (potassium or sodium) siliconates in a solution of water (Col.3, lines 53-56), but Roedel does not disclose a specific dilution ratio for the solution. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to adjust the amount of alkali metal siliconates in water for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

16. **Claims 32-36 and 41-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Tada et al. (U.S. Patent No. 6,074,981) in further view Talpaert et al. (U.S. Patent No. 6,465,088).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Tada et al. disclose all of the limitations of claim 31 as mentioned above.

Regarding claims 32, 34, and 35, Ogawa et al. fails to teach there being at least one layer with raised portions containing temperature-resistant ground material between the oxide-ceramic base material and the photocatalytically active, porous, oxide-ceramic coating. However, Talpaert et al. discloses a thin layer (2) containing silicon oxycarbide particles between the substrate (1) and photocatalytic coating (3) (col.7, lines 31-32). The addition of the particulate material fixed to the substrate would cause the substrate layer to have raised portions thereupon. Additionally, Talpaert et al. discloses the two

layers being applied by dipping and spray-coating, then the substrate undergoes heat treatment at around 450-500^{o} C (col.7, lines 31-42; col. 8, lines 30-31). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the ceramic molded body of Ogawa et al. to include the thin layer of silicon oxycarbide of Talpaert et al. because it "act[s] as a barrier to the diffusion of alkali metals (this being deleterious to the photocatalytic property of the coating), and/or a layer which has an optical function" (col. 7, lines 32-34).

Regarding claim 33, Ogawa et al. fails to teach that particulate material is additionally added in step (a). However, Talpaert et al. discloses that another metal oxide can be added to the photocatalytic coating (col.2, lines 51-57). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the photocatalytically active, oxide-ceramic powder material of Ogawa et al. to include the metal oxide (B) of Talpaert et al. because it has photocatalytic properties in the crystallized state (col. 2, lines 35-38).

Regarding claim 36 and 41, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., and Tada et al., and Talpaert et al. disclose all of the limitations of claims 31 and 33 as mentioned above. Ogawa et al. fails to teach a size for the particles of the layer between the oxide-ceramic base material and the photocatalytically active, porous, oxide-ceramic coating. However, Talpaert et al. discloses that the particulate material should have a mean particle size of between 5nm and 80nm (col.3, lines 32-34). One of

ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the particle size proportions taught by Mori et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", *In re Peterson* 65 USPQ 2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the size of the particulate material of Ogawa et al. to include the particle size of the particulate material of Talpaert et al. because the coating produced by Talpaert et al. possesses excellent optical properties (col.3, lines 20-22).

Regarding claims 42-45, Ogawa et al. fails to teach that TiO_2 in the ceramic molded body is present in at least 40%, 70%, and 100% by weight with respect to the total amount of TiO_2, in the anatase structure. However, Talpaert et al. discloses that the anatase content of the TiO_2 particles of the coating have an anatase content greater than 50% by weight, preferably greater than 80% by weight (col.7, lines 8-11). Talpaert et al. does not teach the exact same proportions as recited in the instant claims.

However, one of ordinary skill in the art at the time the invention was made would have considered the invention to have been obvious because the compositional proportions taught by Talpaert et al. overlap the instantly claimed proportions and therefore are considered to establish a prima facie case of obviousness. It would have been obvious to one of ordinary skill in the art to select any portion of the disclosed ranges including the instantly claimed ranges from the ranges disclosed including the instantly claimed ranges from the ranges disclosed in the prior art reference, particularly in view of the fact that;

> "The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages", In re Peterson 65 USPQ2d 1379 (CAFC 2003).

At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Talpaert et al. before him or her, to modify the size of the particulate material of Ogawa et al. to include the particle size of the particulate material of Talpaert et al. because the coating produced by Talpaert et al. possesses excellent optical properties (col.3, lines 20-22).

17. **Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), Tada et al. (U.S. Patent No. 6,074,981), and**

Talpaert et al. (U.S. Patent No. 6,465,088) in further view Hayakawa et al. (U.S. Patent No. 6,013,372).

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al., Tada et al., and Talpaert et al. disclose all of the limitations of claim 33 as mentioned above. Ogawa et al. fails to teach polysiloxane added to the suspension. However, Hayakawa et al. discloses adding a precursor of amorphous silica (e.g., polysiloxane having a mean molecular weight of less than 3000) to a crystalline titania sol, applying them to the surface of the substrate and is subjected to hydrolysis followed by heating (col. 11, lines 59-67). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Hayakawa et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the polysiloxane (precursor of amorphous silica) of Hayakawa et al. because it helps bind the titania particles to the surface of the base material (col.12, lines 2-3).

18. **Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Tada et al. (U.S. Patent No. 6,074,981) in further view of Chopin et al. (U.S. Patent No. 6,037,289).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Tada et al. disclose all of the limitations of claim 31 as mentioned above. Ogawa et al. fails to teach that water or an aqueous or water-bearing medium is used as the liquid phase in step (a). However, Chopin et al. discloses a process where the photocatalytic coating

contains titanium dioxide particles in a dispersion in which the liquid phase can be aqueous or organic (col.10, lines 31-34). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Chopin et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the titanium dioxide particles in a liquid phase dispersion of Chopin et al. because it is known to use solutions of titanium compounds or colloidal titanium dioxide dispersions to create photocatalytic properties on the substrates (col.1, lines 61-63)..

19. **Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Tada et al. (U.S. Patent No. 6,074,981) in further view Ogawa et al. (U.S. Patent No. 5,595,813 referred to as '813).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Tada et al. disclose all of the limitations of claim 31 as mentioned above. Ogawa et al. fails to teach the photocatalytically active, porous, oxide-ceramic coating improved by irradiating with a laser light, NIR, or UV light. However, '813 discloses that light energy based on irradiation from an ultraviolet wavelength below 400 nm contributes to the photocatalytic reaction (col.4, lines 28-38). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and '813 before him or her, to modify the photocatalytic coating of Ogawa et al. to include the irradiation process of '813 because odors, molds, and substances constituting causes of soiling (hereafter referred to as unwanted substances), which adhere to or are in contact with

the surface of the architectural material where the thin film is formed, can be decomposed and removed at normal temperature photochemically through the photocatalysis of the thin film (col. 4, lines 48-56).

20. **Claims 48, 50-52, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Tada et al. (U.S. Patent No. 6,074,981) in further view of Roth et al. (U.S. Patent No. 4,076,868).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Tada et al. disclose all of the limitations of claim 31 as mentioned above. Ogawa et al. fails to teach that the coating hardened in step (c) is hydrophobised or superhydrophobised to provide a hydrophobic surface or that a polysiloxane solution or alkali metal siliconate solution is used for hydrophobisation. However, Roth et al. discloses the application of solutions of hydrophobic agents, particularly organosilicon compounds like organo-polysiloxane and alkali metal hydrocarbon siliconates (col.1, lines 63-66; col.2, lines 20-21) to the surface of building materials. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Roth et al. before him or her, to modify the hardened layer of step (c) of Ogawa et al. to include the hydrophobic solution containing organosilicon compounds of Roth et al. because it renders the building material hydrophobic (col. 1, lines 63-64).

Regarding claim 54, Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. Tada et al. and Roth et al. disclose all of the limitations of claims 50-52 as mentioned

above. The addition of the hydrophobic particulate material (organopolysiloxane and/or alkali metal hydrocarbon siliconates) that helps the surface of the ceramic molded body become superhydrophobic also creates raised portions on the surface of the ceramic molded body. Since surface roughness also increases hydrophobicity, it would have been obvious to one of ordinary skill in the art at the time of the invention to add particulate material of a different size so that surface roughness can be increased. It is also obvious to one having ordinary skill in the art at the time of the invention to adjust the size of the particulate material for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

21. **Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), and Tada et al. (U.S. Patent No. 6,074,981) in further view of Heller et al. (U.S. Patent No. 5,616,532).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. and Tada et al. disclose all of the limitations of claim 31 as mentioned above. Ogawa et al. fails to teach the addition of a hydrophobising agent in the suspension of step (a). However, Heller at al. discloses the addition of polysiloxane to a photocatalyst contained coating (col.6, lines 44-53). At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Heller et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the polysiloxane of Heller

et al. because when applied to a surface, the photocatalyst-binder composition dries or cures to form a thermosettable, abrasion-resistant composition which adheres onto the surface (col. 6, lines 53-56).

Tada et al. fails to teach that the coating produced in step (b) is hardened in step (c) by drying at a temperature of up to 300 degrees C. However, it would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the drying temperature for the intended application, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

22. **Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (European Patent Application Publication No. 590,477), Kanamori et al. (U.S. Patent No. 6,335,061), Hartmann et al. (U.S. Patent No. 5,451,390), Shima et al. (U.S. Patent No. 6,908,879), Tada et al. (U.S. Patent No. 6,074,981), and Roth et al. (U.S. Patent No. 4,076,868) in further view of Heller et al. (U.S. Patent No. 5,616,532).**

Ogawa et al., Kanamori et al., Hartmann et al., Shima et al. Tada et al. and Roth et al. disclose all of the limitations of claim 48 as mentioned above. Ogawa et al. fails to teach producing the superhydrophobic surface using polysiloxane. However, Heller at al. discloses the addition of aryl or alkyl derived polysiloxanes (col. 8, lines 3-6) in the coating mixture. At the time of the invention, it would have been obvious to one of ordinary skill in the art, having the teachings of Ogawa et al. and Heller et al. before him or her, to modify the photocatalytic coating of Ogawa et al. to include the polysiloxane of

Heller et al. because it helps form a hydrophobic, smooth, difficult to oxidize, thermostable, and hard film (col.8, lines 6-8).

Double Patenting

23. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

24. Claims 1, 5-15, 20, 23, 27, and 28 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-17 of copending Application No. 10/516,197 in view of Talpaert et al. (U.S. Patent No. 6,465,088). Although the conflicting claims are not identical, they are not patentably distinct from each other because they claim virtually the same ceramic molded body excluding the addition of Al_2O_3 and SiO_2 which Talpaert et al. discloses can be included in the photocatalytic coating.

This is a provisional obviousness-type double patenting rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NICOLE HARRISON whose telephone number is (571) 270-3741. The examiner can normally be reached on Monday –Thursday, 8:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571) 272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

NKH

/Jennifer McNeil/
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